SCALING-UP ACCESS TO SAFE DRINKING WATER: THE CASE FOR COMPLEMENTARITY STRATEGIES AND ACTIONS BETWEEN BOTTLED WATER AND PIPED NETWORKS

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Abstract

Background:

Following the Millennium Development Goals (MDG) and Sustainable Development Goals (SDG), most governments in developing countries have set the ambitious target to reach universal access to safe drinking water by 2030. Recently interest has focused on how bottled water and piped systems can complement each other as solutions with the potential to solve the problem, particularly in a rural context. The current answers to that question should influence public policies, regulation and infrastructure choices for decades to come.

M e t h o d:

We report four case studies made in the countries of intervention of 1001fontaines (Cambodia, Madagascar, Myanmar, Vietnam), a social business with 15-years of experience in operating decentralized water plants ("kiosks") producing bottled water in rural and peri-urban contexts for vulnerable populations. We evaluated the results of internal and external research on different criteria: scale, impact, customer segmentation, usage and adoption, quality and continuity of service.

Key findings:

1) Pipes are most of the times exclusive to areas near commune centers where full connection is available, whereas kiosks will reach more isolated zones through home delivery and their retailer network

2) Consumers make a clear distinction between “drinking” bottled water when it comes to quality and “improved” piped water for quantity (cooking, cleaning, domestic use)

3) We estimate that at least half of piped networks in the areas we serve are non-compliant with the bacteriological WHO norms on quality. By contrast, the 1001fontaines compliance rate is systematically above 90%

4) Water kiosks appear to be more quality and service resilient to changing environmental conditions (droughts, salinity, floods, cyclones …) than piped systems

Conclusion:

The 4 complementary advantages of bottled water over piped systems are efficient access to last-mile beneficiaries, customer preference of bottled water for drinking purposes, drinking water quality and continuity of supply. Therefore, complementarity is a reality and should remain so in the decades ahead. Investing now in cost-effective and responsible solutions like water kiosks is a sustainable and environmentally friendly strategy in order to scale-up access rapidly to safe drinking water for vulnerable rural populations.

Introduction: complementary vs competition - a strategic question in the context of the UN SDGs

Following the Millennium Development Goals (MDG) and Sustainable Development Goals (SDG), most governments in developing countries have set the ambitious target to reach **universal access to safe drinking water by 2030**. The gap to fill is enormous when one considers **that 2/3 of the world's population still lack reliable access to safe drinking water**, resulting in economic, social and environmental challenges ahead, in order to reach this goal. In that context**, two alternatives** to traditional sources of water (surface, rain, groundwater, wells) **have the potential to be part of the solution: piped networks and bottled water**. Different models from the public, private and non-profit sector are already impacting a growing number of lives. Some promising innovative solutions are emerging, such as privately-owned micro-grids or decentralized water plants producing bottled water ("kiosks").

One of the most strategic questions for governments regarding water is **whether piped networks and bottled water compete or complement each other**. The current answers to that question will influence public policies, regulation and infrastructure choices for the decades to come. It is even more crucial when one considers the time frame, the investments at stake, and the pressing needs of the most vulnerable bottom-of-pyramid households.

Complementarity is a reality: evidence from the ground

15 years of experience in operating water kiosks in rural and peri-urban contexts of 4 developing countries (Cambodia, Madagascar, Myanmar, Vietnam), have convinced **1001fontaines that bottled and piped water are complementary solutions that reinforce each other to improve the health of vulnerable populations**.

We have come to this conclusion through the **observation of the actual situation** on the ground. Indeed, **the 4 complementary advantages that make bottled water essential are:**

- **Efficient access to last-mile beneficiaries**: pipes are most of the times exclusive to areas near commune centers where full connection is available, whereas **kiosks will reach more isolated zones** through home delivery and their retailer network

- **Customer preference for drinking purposes:** consumers make a clear **distinction between "drinking" bottled water when it comes to quality and "improved" piped water for quantity** (cooking, cleaning, domestic use) when they look at drinking purposes.
    - A **low percentage of households with pipe connections actually drink tap water** (10-15% in Cambodia, 0% in Myanmar, 11% in Vietnam).
    - This level is even lower for 1001fontaines customers who have a connection: in Cambodia **96% of them are exclusive to our brand** and only 1% will also drink tap water
    - **1001fontaines water sales are higher in villages where pipes are connected** (+7% vs average in Cambodia) because customers have a better level of health awareness overall

- **Water Quality:** We estimate that **at least half of piped networks** in the areas we serve are **non-compliant with the bacteriological WHO norms on quality**. By contrast, the **1001fontaines compliance rate is systematically above 90%**. This can be explained by:
    - The absence of treatment systems (in Myanmar villages, piped systems are not treated; this is the case for 40% of piped systems in the world[1])
    - Technical issues caused by intermittent supply
    - Poor or inexistent quality control procedures

- **Continuity of supply:** Water kiosks appear to be **more resilient to changing conditions (droughts, salinity, floods, cyclones …)**, compared to piped systems that depend on expensive fixed distribution systems, larger treatment costs and single and sometimes vulnerable sources. If a water source is negatively

[1] "The untapped potential of decentralized solutions to provide Safe, Sustainable Drinking Water at Large Scale", Dalberg, 2017

affected by climate change (ex. source dries up, quality changes), **smaller investments are needed to adapt or relocate the raw water source**, whereas large piped systems would require costly infrastructure changes.

Figure 1: Summary of country benchmarks

Area	KPI	Cambodia	Madagascar	Myanmar	Vietnam
Scale & impact	Areas targeted	Dense / isolated rural	Periurban and dense / isolated rural	isolated rural	Periurban and dense rural
	Coverage	Pipe: population centers Bottle: population centers + last-mile	Pipe: population centers Bottle: population centers + last-mile	Pipe: population centers Bottle: village level	Universal
	Penetration rate	Pipe: 15-25% 20L Bottle: 50-70% 1001F: 20-30%	Pipe: ~25% 20L Bottle: approaching 0% 1001F: 15-20%	Emergent solutions	Pipe: 80-100% 20L Bottle: 70-90%
Usage and consumption	Main usage of pipe water	Domestic	Domestic	Domestic	Domestic
	1001F performance in areas where pipe is available	+7% vs other kiosks	-	-	-
	% of population drinking pipe water with treatment (when household connected)	10-15%	-	0%	11%
	Main reasons for drinking 1001F water	1. Price 2. Home delivery 3. Taste	Cleanness / quality	1. Health 2. Use for children 3. Home delivery	1. Quality 2. Convenience
Quality	% compliance to WHO bacteriological norms (E-coli)	Pipe: 20-30% compliant 1001F: 96% compliant Other bottle: 60-65% compliant	Pipe: not regularly tested put presumed low 1001F: >90% compliant (including chemicals)	Pipe: not regularly tested put presumed low 1001F: 100%	Pipe: < 50% compliant 1001F: 96% compliant Other bottle: 5-35% compliant
	Type of monitoring	1001F: internal monthly tests + third-party verification + quality management plan Pipe & informal bottle producers: irregular testing, no quality management plan			
Continuity of supply	Resilience of bottle vs pipe	Higher (droughts)	Higher (continuous supply at standard quality)	-	Higher (salinity)

Betting on the right strategy

The question is whether, in the near future, **piped systems could become the solution and therefore a substitute to bottled water** when it comes to last-mile access, customer preference for drinking, drinking water quality and continuity of service.

Considering the situation in the field and current trends at macro-level, we believe that **safe and affordable drinking water piped into people's home will not become a universal reality in rural areas and some developed areas for decades**. Economic, environmental and societal constraints will not make ensuring drinking level quality in the rural piped networks worth, compared to betting on the complementarity between quantity provision by pipe and quality for drinking needs by decentralized systems such as water kiosks. There are three main reasons for that:

- The required **investment to expand piped supply** (in South East Asia, the **cost per capita is around $ 200 for piped networks vs less than $25 for kiosks**) will prevent it in the short and middle term from accessing all households, the rural areas with low density being the least attractive
- The gigantic **economic and environmental costs to sustain continuous supply and quality** of piped systems (in a context where an estimated 1 billion people connected to the pipe face daily issues due to **intermittent water supply**)
- Last, even if we managed to solve the two problems above, the social barriers would remain high because of the **strong reluctance of most of the population to drink tap water**.

The **rapid expansion of the bottled water market is inevitable**. It does not come without **serious challenges**. The first one is the **use of plastic** that should be mitigated through behavioral change, the development of a circular economy and, in our view, the preference to give to reusable 20-L jugs over single use bottles[2]. The second one,

[2] A specific note on that matter will be drafted early May 2020

which is more critical in the short-term, relates to the **quality of the water itself**. If 1001fontaines does not see piped supply becoming the sole provider of drinking water, we do not believe either in bottled water becoming a universal solution for safe drinking water if it is fully left in the hands of operators with no governmental control.

This vision aligns with our field observations, notably in Cambodia and Vietnam, where small private bottled water suppliers do not respect any quality standards and operate under the radar. **The sector is highly vulnerable to intense informal competition**, **and as such requires public regulation**. That is why the model set up by 1001fontaines, in which the kiosks fall under public ownership, while being operated by private entrepreneurs, seems the right combination to ensure quality and affordability (public service), and to sustain the activity over time (private incentives). Water kiosks offer the possibility to set-up **micro Public Private Partnerships**, thus **involving the public sector more by building their own infrastructure**.

We believe that **there is a future for our water kiosks even in the context of a rapid development of bottled water**, and that risk of being cannibalized by international or local commercial entities remains low. First, because of our specific positioning as a public service provider, and second because the cost structure of our decentralized model should guarantee to keep the price of water affordable for the vulnerable.

Acknowledging the need for complementarity of solutions is just the first step**; making it happen will raise other challenges**. In a sector involving a high number of stakeholders and a lot of decentralized, unorganized players, it will be challenging to control the expansion of access to safe water as well as monitor quality and adherence to standards and regulations.

Making it happen

There are reasons to believe, however. For example, in a country like Myanmar, where kiosks and pipe are just emerging, there is already strong support by high-level authorities to integrate the 1001fontaines model into a comprehensive WASH strategic plan.

This could **position 1001fontaines as a fully institutional player, able to partner with governments,** to identify the areas, where a decentralized approach focused on safe drinking water would be more relevant than a centralized piped supply aiming at addressing all the needs. Cambodia is also a good example of that: we are working in cooperation with the authorities to test, through our regional laboratories, the potability of the different players in the market.

Cooperation with other operators and integration are also the path forward: In Vietnam, we are already discussing potential technical and business synergies with piped micro-utilities. In Madagascar, we are supporting piped supply private actors and NGOs to improve their quality practices, and in one commune we are even testing a synergized model (quality control, shared maintenance services, exchange of services for raw water volume …) with a company whose CEO sits on the board of our local organization.

The only chance we have to meet the SDGs' targets one day is to **change our paradigm**. By that, we mean that **the stakeholders involved** (international institutions, governments, private sector players, NGOs …) **should join forces to promote the complementarity** of tap and bottled-water, through concerted public planning, appropriate regulatory measures, adapted financing and most importantly enhanced operational collaboration.

In conclusion, because of the four advantages of bottle over piped systems (access to last-mile beneficiaries, customer preference for drinking purposes, drinking quality and continuity of supply), complementarity is a reality and should remain so in the decades ahead. Investing now in cost-effective and responsible solutions like water kiosks is a sustainable and environmentally friendly strategy in order to scale-up access rapidly to safe drinking water to vulnerable rural populations.

Appendix 1: Cambodia case study.

Country context

Although Cambodia is one of the fastest-growing economies of the world, poverty remains a reality with 37% of the population living in poverty and an additional 21% still vulnerable according to the UNDP [3].

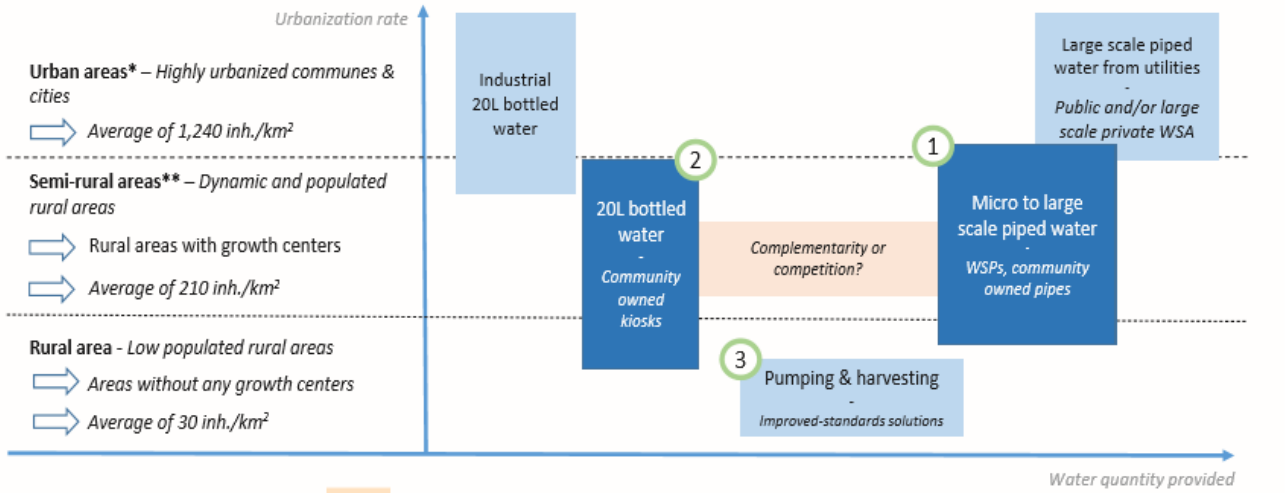
Water is available everywhere and in good quantity, through surface sources mainly (ponds, rivers), and partly through groundwater. There are some drought episodes happening with climate change, but they are still of short duration and the rainy seasons remain significant.

Although 65% of people have access to an improved water source, only **16% of the Cambodian population in rural areas have access to safely managed and clean water supply services**[4], which is now the reference indicator when it comes to the 2030 SDGs. Though the National Plan aims at achieving national coverage by 2030, **the country is far from reaching this target.**

Clusters of drinking water access solutions

The 3 clusters that are considered solutions for supply of drinking water are:

- Micro to large scale **piped water service** in rural and semi-rural areas
- **20L Bottled** water sales
- **Pumping & harvesting** solutions: wells, borehole, protected springs, rainwater harvesting tanks



Clusters of drinking water supply solutions ranged in their area of intervention[5]

In rural Cambodia, two pipe models coexist. The first one is **community-owned piped water supply**, which is funded and structured by NGOs like World Vision. There is no clear data about their scale but it is considered as marginal at a national level. This is explained by the fact that the growing and dominant model is **commercial piped water supply (or WSP for Water Service Provider)**. Indeed, *"the huge amount of these privately owned and managed piped networks is a specificity of Cambodia. These actors generally work on a same overall model: They are private entrepreneurs who manage their own business, meaning they oversee their production facility (for pumping and treating the water) and pipe network. As of today (2017), estimates report around **423 active WSPs** in the country, covering a total of around 600 communes in Cambodia"* [6]

[3] UNDP 2019
[4] Cambodia's voluntary national review 2019 of the implementation of 2030 agenda, p.61
[5] Access to drinking water in rural Cambodia; current situation and development potential analysis, SEVEA, May 2017 (study ordered by 1001fontaines)
[6] Access to drinking water in rural Cambodia; current situation and development potential analysis, SEVEA, p.75, May 2017

The second cluster is 20L bottled sales, with both **family businesses** selling to local grocery shops and deliverers, and **community-owned kiosks** operated by a local entrepreneur. We estimate that there are **around 500 active players** in rural Cambodia. Teuk Saat 1001 is the main player of the market, with 240 active kiosks spread accross 19 of the country's 25 provinces.

Alternatives to pipe & bottled water are traditional pumping & harvesting solutions, which provide improved water without any guarantee on their drinkability. In a study made in 2014, we found out that the so-called "protected" groundwater / surface water sources are **most likely to be contaminated** by bacteria, whereas the collection of rainwater is a relatively safe mode if properly stored.[7] People traditionally boil them before drinking, but not always.

In addition, we have observed the presence of other market-based solutions (chlorine tabs, ceramic filters) but, apart several players like Hydrologic, the remain marginal in Cambodia.

Scale and impact

Below is a comparison of WSP (dominant pipe models) and Teuk Saat 1001 (dominant bottled water player) in terms of scale and impact:

KPI	WSP 2017	TS1001 2017	TS1001 2020
Target population – 2013 census (1)	14.8 M	12 M	12 M
Inhabitants in communes with the service (2)	5.9 M	1.6 M	2.6 M
Inhabitants within a zone covered (3)	2.2 M	1.6 M	2.6 M
Direct customers (4)	1 M	300,000	484,000
National coverage % (3/1)	15%	13%	22%
National penetration % (4/1)	7 %	3%	4%
Local coverage % (3/2)	37%	100%	100%
Local penetration % (4/2)	17%	19%	19%

The figures above illustrate the different dynamics in the expansion of the models:

- On a national scale, **the footprint of WSP is more than twice as high as TS1001** (although WSP are also present in the bigger cities)
- They have a **comparable market base** (2-3 M people)
- Their **local penetration is similar** (17% vs 19%). In other words, each newly installed piped system will eventually reach the same number of end consumer as a kiosk. **Pipes will reach many more customers in a smaller radius** near commune centers, where full connection is possible (40-50% local penetration within a radius of 5 km versus 23%), but **kiosks will reach more isolated zones** through home delivery and their retailer network (100% local coverage vs 37%).
- From a distribution standpoint, **kiosks are thus better positioned than piped water schemes to serve more remote areas**
- For WSP, most of the expansion is done when they extend to a new zone, whereas kiosks keep on converting new clients (through the incentive of the franchise structure on sales, best practices, reinvestments …) with an annual steady growth between 1-5%. **The penetration rate of kiosks rises more steadily than WSP.** Another trend that it benefiting to water kiosks is the improvement of rural roads.

[7] Water source and diarrheal disease risk in children under 5 years old in Cambodia: a prospective diary based study, Pr Paul Hunter, 2013

Customers segments served

70 communes where TS1001 operates are equipped with piped networks (30% of total), which shows that:

- The overlap between the systems is limited at a national level
- Yet, considering that only 5-10% of the Cambodian households are equipped with pipe, both systems seem to serve similar areas

Going further, our data show that **their demand is synergetic** since good practices and safe consumption habits are reinforcing each other in the same households: **the more piped water connections there are in a given area, the more villagers will be willing to pay for O-We (the Teuk Saat brand) drinking water**:

- While there are on average 30% of customers connected to pipe, this number rises to 50% when the site is a Tier 1[8]
- Our kiosks treating water from the pipe are outperforming our portfolio of sites: their typical sales volume is 7% above average and they represent 36% of all tier 1 sites(see graph below)[9]

Water source	Nb sites	%	Tier 1	Tier 2	Tier 3	% Tier 1	Sales March 2020 (L/day)	% vs average
Pond	56	24%	21	24	11	20%	2 217	0%
Raw water	4	2%	1	1	2	1%	1 743	-21%
river	34	15%	23	9	2	21%	2 345	6%
water_supply	71	31%	38	28	5	36%	2 368	7%
well	65	28%	24	22	19	22%	2 008	-9%
Total	**230**	**100%**	**107**	**84**	**39**	100%	**2 215**	0%

Usage and consumption

A survey was conducted in 2019 among O-We customers and non-customers[10]. The key observations were:

- 94% of O-We customers connected to the piped network use bottled water as their main type of drinking water, whereas **only 1 % of them use tap water as their main type of drinking wate**r.
- 76% of them will use tap water as their main source for cooking and tea
- Those figures are **consistent across both the rainy and dry seasons**. This is interesting because 5 years ago many O-We clients were moving back to rainwater during the rainy season
- The three main reasons why customers buy O-We **are price, home delivery and taste**

Thus, there is clear evidence that O-We customers 1) are **loyal to bottled water when it comes to drinking** 2) **purchase water from different sources depending on usage** (drinking, cooking, cleaning, domestic use) and 3) **make a clear distinction between "clean" 1001fontaines drinking water and "improved" piped water.**

The **perception of quality is a key asset for a water kiosk** and a negative image issue for WSP.

It is also to be noted that Cambodians do not like the taste of chlorine, which impacts the development of tap water as a drinking water source.

[8] O-We customer survey 2019

[9] Teuk Saat 1001 site reports March 2019

[10] O-We customer survey 2019

Quality

The 2017 rural Cambodia market study highlights that *"as a targeted drinking water model,* ***kiosk water's main advantages are to be found in terms of quality****. Its water is meant to be used for drinking, and as such the main point is to ensure perfect quality. On the contrary,* ***WSPs, who are seen as a convenience, concentrate more on the quality of the service*** *surrounding the delivery of water itself. It is cheap, available on premises all day and in unlimited quantity"*[11].

It is easy to understand some of the reasons why the quality of piped water is lower (skill gaps, technical and financial constraints …). But that does not mean that bottled water automatically stands for quality. A quality study is currently being conducted by the NGO WaterAid in the province of Kampong Chhnang. The results of 134 microbiological tests are presented below:

Segment	# tests made	% compliance E.Coli	% compliance Coliform
Pipe Water	21	29%	10%
Pipe Water in Households	18	22%	11%
Bottled Water - Teuk Saat 1001	25	96%	96%
Bottled Water - other	70	63%	20%
Total	134	58%	21%

Unfortunately, these results illustrate **how dramatic the situation is in rural Cambodia when it comes to water quality, not only for piped water but for the bottled market as well**.

Continuity of service

The Sevea 2017 report compares the resilience of both models to three factors, with a scoring from 1 to 4 (1 means the criterion is not met, 4 means there is little room for improvement):

- TS1001: Grade 3.5 / 4: "As of now, neither natural factors nor human activity endangers TS1001's supply process. As chances of chemical contamination are still weak, and sampling possible, it is also the **most resilient source to any chemical leakage.** As such, it almost garners the highest note, just losing half a point to the time it would need to detect that chemical pollution".[12]
- WSP: Grade 2.5/4: "Although rarely directly endangered by natural factors for now, **WSPs will soon have to face consequences of human activity and global warming in Cambodi**a. Moreover, their lack of insurance when facing human destruction makes them susceptible to risks, which explains the mitigated grade earned"[13].

The **main climate risks for TS1001 are seasonal flooding** resulting from increasingly forceful rains during the rainy season and, **more importantly, severe droughts** due to unreliable annual rainy seasons. In 2019, the rainy season failed to arrive until August, at which point water levels had fallen so severely that they fell to a 100-year low in the Mekong. Many of 1001fontaines primary water sources were severely depleted. We anticipated that situation by **proactively incorporating climate-sensitive criteria into our planning from the start**:

- During site selection, water resource assessments are conducted to locate a reliable source
- A continuity plan is drafted in case of droughts, with different options possible (source water from neighbouring kiosks, hire water tankers, assist to change water source if possible)

Such a mitigation plan enables TS1001 to 1) **facilitate / anticipate on-the-ground decision making** and 2) share a budget request with potential donors[14].

[11] Access to drinking water in rural Cambodia; current situation and development potential analysis, SEVEA, p.20, May 2017

[12] Access to drinking water in rural Cambodia; current situation and development potential analysis, SEVEA, p82, May 2017

[13] Access to drinking water in rural Cambodia; current situation and development potential analysis, SEVEA, p79, May 2017

[14] Assessing the resilience of Safe Water Enterprises, Dalberg, p72, April 2020

Long-term vision

We align with the conclusions of the 2017 Sevea report stating that *"especially because currently and for the coming years, WSPs will clearly not be able to follow the development trends needed and deliver a safe drinking water service, with the exception of large WSPs (and, to some extent, medium ones) The others will have to put a lot of efforts to reach this level of quality and reliability. This will take resources (mainly on capacity building, quality control, etc.) and time. In addition,* ***even when acting in the same area, WSPs and kiosks each bring a different but crucial added value in terms of water health related impact.*** *The limit of this complementarity is when kiosks are implemented in areas with large WSPs, already sufficing in terms of water access and quality. The relevance of this complementarity is particularly true in challenging zones. There, the WSP model is harder to transpose because of the higher investments it would need, whereas the kiosk model is a low-cost solution for the impacts it can bring"*[15].

Alongside piped water, bottled water has expanded rapidly in rural Cambodia. The portability of jugs makes it **far more flexible in covering the last mile** while piping network extensions will always be limited to denser areas for economic reasons.

As explained earlier, the lack of confidence in piped water and the growing trend of bottled water consumption lead us to think that the **complementarity of both solutions will be the long-term pattern.**

However, in contrast to piped-water infrastructures, the **1001fontaines water kiosks are public infrastructures** (communal) operated by a private entrepreneur. As such, **the kiosk model alleviates the risk of defaulting on the service** as kiosks entrepreneurs can be easily replaced.

[15] Access to drinking water in rural Cambodia; current situation and development potential analysis, SEVEA, p22, May 2017

Appendix 2: Madagascar case study.

Country context

With 77.8% of the population living below the poverty line (less than $ 1.9 a day), Madagascar is one of the poorest countries in the world. 72% of the rural population does not have access to a safe source of water. For every 1,000 children born in Madagascar, 120 die before the age of five (WHO / UNICEF 2012). Waterborne diseases are one of the main threats to their health. The 1001fontaines project intervention zone on the east coast of the Big Island, often called the "disease area" by the local population, is particularly affected by epidemics related to unsafe water, including cholera. Water is abundant in this region but its poor quality is a major problem.

In Madagascar, 1001fontaines (through its local NGO Ranontsika "our water") operates in the rural and peri-urban areas of the East Coast.

Clusters of drinking water access solutions

Based on our field observations, in 2019 we developed a cartography of the systems available in the surroundings of our operating kiosks. Although limited to 19 sites, it reflects well the overall situation in Eastern Madagascar.

Commune type	# 1001F kiosks	Bottled water	Pipe	Handpumps	Wells
Rural isolated communes (< 5.000 PAX)	5		5	3	5
Rural middle communes (5.000-10.000 PAX)	7		5	5	5
Rural large communes (10.000 - 50.000 PAX)	2		2		2
D. Periurban area of Tamatave	5	5	5	5	5
Total	**19**	**5**	**17**	**13**	**17**

The **piped supply systems** from the state-owned company JIRAMA are now present in Tamatave (2nd largest city of the country) and are gradually **spreading to the level of medium-sized municipalities**. Projects to **extend these networks to isolated households** are implemented by NGOs, such as WaterAid, or private actors. In Madagascar, national policy has moved away **from community-based management of piped systems to embrace private sector** management. But this appears to only **work in medium to large towns**, where there is enough wealth to build up the customer base needed to sustain the business. **Piped systems are still built in small rural villages** - either that or systems of wells and hand pumps - **but we have observed that most of them eventually fail** because there is no sustainable way to manage them for the long term (people will not pay for the service and it will be very challenging to sustain private sector management)

In the city of Tamatave, it is common for homes served by the networks to also have **manual pumps and wells to deal with frequently encountered power cuts**. This is the case for around 60% of the inhabitants of the city of Tamatave[16].

A supply of bottled water is available in Tamatave but at prohibitive prices for vulnerable populations (Sainto brand – US$ 14 for 20 liters for consignment and US$ 7.2 for recharging… 15 times more than the sale price of Ranontsika in Tamatave). There is **no 20 liter bottled water market in rural communes**. 1001fontaines is a pioneer on that space. Distribution for smaller volume bottled water is widespread and available everywhere but also exorbitantly priced so not accessible for daily consumption by the general population.

While Ranontsika stations primarily source water from their own wells, a pilot was implemented in a medium sized town (Foulepointe) in the project zone, whereby Ranontsika sourced water from an existing piped supply. The water quality at the tap was such that our treatment provided clear improvement of the quality. Ranontsika has been actively working with the piped supply manager –the CEO of the company Sandandrano actually sits on the board of Ranontsika – to find **ways in which the two entities can work with each other and synergize.** Ranontsika, for example has done **quality testing and simulations to help the company improve their overall quality**.

[16] MacCarthy, M.F.;Annis, J.; Mihelcic, J. R. Unsubsidized self-supply in eastern Madagascar. Water Alternatives. 2013, 6 (3), 424-438

Maintenance services have also been shared and discussions have been launched into ideas like **exchange of services for raw water volume**. The overall idea is to create a virtuous circle, where both actors can benefit by helping each other to solve specific issues.

Scale and impact

There is little data at national level related to coverage and penetration but observations show that **piped systems are growing rapidly throughout the country**, whereas **water kiosks are still a niche,** with Ranontsika being the biggest player in the country with its network of 19 kiosks.

The penetration rate of Ranontsika is at a similar level to Cambodia (around 20%).

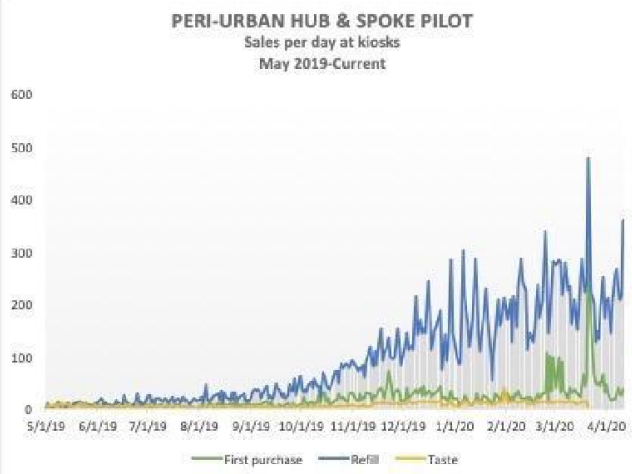
Customer segments served

There is a strong geographic overlap between piped systems and kiosks. In fact, most of our stations are in places with piped supply.

Water kiosks and pipe serve similar segments in large to mid-towns. For both systems:

- Clients, who can afford to easily buy into the service are approached first to build up the base of the clientele and revenue.
- Only when this is set can one think about ways to service the most vulnerable population and find out how they can afford the new piped connection at home or the deposit for bottled water

In Madagascar, we also observe that **their demand is synergistic,** since good practices and safe consumption habits are reinforcing each other in the same households. The typical case is that our product demand is reduced during implementation of piped system because new systems mean new marketing and sensitization but after a while the system breaks down and sales go back to a level that is slightly above the previous one.



Another element of evidence comes from the **peri-urban areas of Tamatave,** where we launched our pilot last year and where sales keep on increasing (see graph). Most households are equipped with tap water, so they have a **strong awareness on health issues, which encourages the adoption of our product**.

Usage and consumption

A qualitative study was conducted in 2018 among Ranontsika customers[17]. The key observations were:

[17] Understanding the consumer, drinking water ecosystem & inherent market dynamics to feed into preparation of marketing mix elements, Kantar IMB, February 2018

- The main reason why they buy the water is that they **perceive it as "clean"** and providing an **obvious upgrade to their existing water sources (hand pump or tap water)**: nobody falls sick, water looks transparent and clean, absence of floating particles, smell of fresh water, taste is not salty
- There is a strong **reluctance to drink tap water because of the risks to health** and the high level of perceived 'saltiness'
- Many people are **encouraged by their doctors to use filtered water**.

Ranontsika water is used primarily for drinking. Yet, if alternative sources are 'salty' or have strong taste, people may use it for producing fruit juice or cooking. If there is a high level of iron in alternative sources, people will in some cases prefer to wash their clothes with our bottled water.

Quality

Although there is no public study available, water **quality is clearly the main challenge,** no matter what the systems in place are. Water supply is expanding throughout the area thanks to the development of piped systems, although isolated rural communities are still largely unserved by these systems. However, **the limited resources and technical difficulties observed in certain rural municipalities (poor quality design), as well as in the city (JIRAMA power outages) imply that continuity and quality of service are not guaranteed today**. Many systems managed by the community are no longer functional today. People often need **to revert to risky solutions** (unprotected or non-functional wells, manual pumps heavily contaminated with lead, etc.).

Customers **understand that Ranontsika allows them to have access to quality drinking water guaranteeing human health**, which is separate from solutions allowing access to lower quality water, known as improved water but in quantities suitable for non-food uses (agriculture, cooking, cleaning, etc.). **Ranontsika is also being increasingly called upon by NGOs and private players** (CRS, CARE, USAID, Sandandrano …) to perform **laboratory analyses and give advice on improving water purification processes of their gravity / pipe systems.**

It is important also to mention that our kiosk model carefully considers **water quality monitoring** and this is a vital part of the model. Revenues from sales support our own labs and allow us to make frequent, monthly water quality testing of our entire network possible. In addition to self-monitoring, **our labs also participate in evaluating and discerning the best treatment method**s for each particular raw water quality encountered. When one considers that revenue generated from within serviced communities is directly contributing not only to local monitoring capacity but also to the growth of institutional knowledge of local water resources, it then highlights the potential of this approach.

Continuity of service

Water kiosks can be **more agile and flexible to changing conditions**, compared to larger systems that depend on expensive fixed distribution systems, larger treatment costs and single and sometimes vulnerable sources. For example, if a pump fails in a water kiosk, it is much easier and quicker to replace than a faulty pump in a large system. This is especially the case for us, where kiosks are linked to a spare parts distribution system. If a water source is negatively affected by climate change (ex. source dries up, quality changes), **smaller investments are needed to adapt or relocate the raw water source**, whereas large piped systems would require costly infrastructure changes. Although the kiosk model is not immune to challenges regarding continuity of service (for example, delivery vehicle issues), one could argue that above ground **issues are easier to identify and address**, especially at the scale of drinking water volumes, over high volume underground distribution networks and production works that are sometimes separated by many kilometers.

Long term vision

We believe that there is **no risk that the 1001fontaines becomes obsolete with the growth of piped water schemes**, because it will be **impossible to get the quality required for drinking purpose** considering 1) the level of resources required and the historical track-record and 2) the operational difficulties that will prevail over time.

The **risk is more that kiosks are today so marginal that they will be left out** of large-scale development programs.

In the long-term, we believe that **complementarity is the solution**. We must start **thinking creatively and realistically about water potability**. We have to acknowledge that a high quantity of water is vital for hygiene and sanitation purposes and that piped water does this well. We also have to acknowledge that the kiosk model is better able to provide high quality drinking water that adheres to national and international norms. Both models have strengths where the other has weakness – volume and quality – so there is a natural opportunity for synergy that should be seriously explored, as is already the case today with our partner Sandandrano in the commune of Foulepointe.

Appendix 3: Myanmar case study.

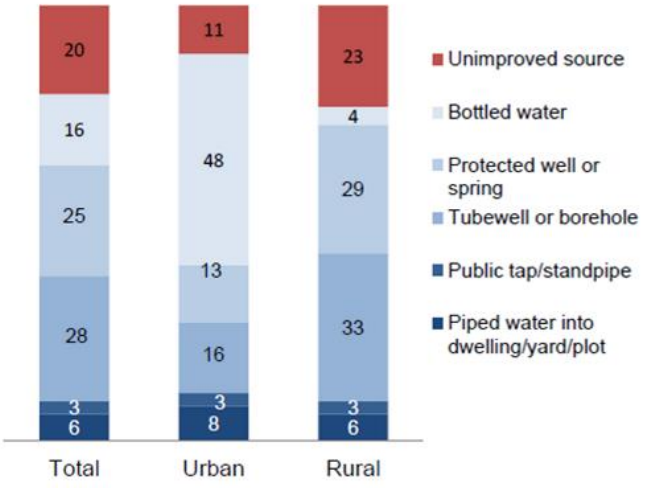
Country context

Myanmar is a large country in South-East Asia with 54 million inhabitants, 66% of which are living in rural areas. Ranked 183rd country in the world on its Human Development Index, Myanmar faces many challenges related to health and WASH.
In rural areas, only 3% of the population are equipped with tap water, while the rest relies on improved water sources (78%), such as wells, or even on water bodies shared with animals (19%)[18]. In these circumstances, there is **no solution today to guarantee the quality of drinking water for two thirds of the Myanmar population**. With **infant mortality** remaining one of the worst in Asia and 29% of children under 5 experiencing stunted growth, **WASH and specifically water has become a critical challenge for the country**

In Myanmar, 1001fontaines (through its local partner "Network Activities Group" (NAG), which is the largest Burmese NGO) has started a rural pilot in 2019 in the "Dry Zone" (an area that covers around 20 million inhabitants in the three Provinces of Mandalay, Magway and Sagaing).

Clusters of drinking water access solutions

The distribution of drinking water by residence is presented below[19]:



The graphic shows that **access to purified bottled water is still very low in rural areas** (4%) and quite developed in urban areas (48% of HH), but the market is still not saturated.

23% of the population living in rural areas are still using unimproved water as the main source of drinking water, putting their health at stake.

In the regions of Magway, Mandalay and Sagaing, **50% of the households are using deep tube wells**, which give access to water but not to safe drinking water.

The **piped water system is not yet developed in the country**. The national strategy consists of focusing on developing micro-water piped systems according to the population density.

Indeed, depending on the area and the available water sources, people use underground, surface water, river or deep tube well as sources of drinking water. In the Dry Zone, people face **water shortages** during the end of the dry season (March to June). They typically **store the water in 50-gallon cement tanks**. Water from these cement tanks is used for cooking, washing and animal drinking.

For drinking purpose, water is transferred to a clay pot., which is a particularity of Myanmar. All houses have some to store the drinking water. From the point of collection until the time of consumption, the water is kept in these pots and everybody drinks it from the same cup. We can also find these pots beside the fences of the houses or along the road. The Burmese families provide free drinking water to anyone who needs it, be it visitor, traveler, or neighbor. It is related to the Buddhist philosophy and kindness. It is even highly representative of the mindset of the Burmese: help people in need. These water stands are maintained by the members of the household and anyone who passes can have a drink.

[18] Joint Monitoring Program 2014
[19] Ministry of Health and Sport, *Myanmar demographic and health survey,* March 2017

When they do not have a private well, the household members collect water from **a community well** or a neighbor's well. They pick up the water in yellow 5-gallon jerrycans. Most of the time, the owner of the well or the Water Committee sells the water. The profits are used for the maintenance and repair of facilities.

In some villages we also found local entrepreneurs or village members collecting untreated water from the pond, river, community wells or personal wells and selling it door to door, carried by trolley or ox-cart.

The villagers can walk 2 to 5 miles to get ''drinking'' water, if they consider that the quality of the water from their well or from the nearby river is not good enough. In this case, they collect water from shared open wells, deep tube wells or ponds. Most of the time, there is only **one point of collection for the whole village** and sometimes for surrounding villages too.

Lastly: **the drinking water is never treated before consumption.**

Scale and impact

As seen above, both bottled water and piped systems are emerging solutions in rural Myanmar.

The **main institutional actor in piped networks is UN-Habitat**, which has launched Community Water Pipe projects in 300 villages. The systems are financed by the communities themselves (50%) and by grants (50%). However, the water is **not treated**.

In the rural areas, the bottle market is comparable to the Cambodian market with cheap and low quality of purified water. The production factories of these local brands are difficult to localize and are mostly family businesses. In the **remote villages, there is almost no competition**, except for 1liter bottles that can be bought on the main roads.

To our knowledge and according to the Department of Rural development, from the Ministry of Agriculture and Livestock, **1001fontaines is the first community-owned kiosk program in the country**. Although piped systems are mentioned in the national WASH strategy, there is **no clear quantified objective set by the government.**[20]

Customer segments served

Given the stage of the project, it is too early to assess if there is a geographic / segment overlap between piped and bottled water.

We have conducted a client survey early 2020 in our 2 pilot sites, which gives preliminary information that is consistent with the national picture[21]:

- The main reasons for buying our water are **health impact (62%), use for their children (14%) and convenience of the delivery system (12%)**
- **In 90% of households, all family members drink our water**
- 64% of users are regular (1 bottle in less than 5 days), 36% are un-regular
- **76% of customers do not drink only "our dry zone" (the name of our local brand) water; of them 85% are continuing to drink water from the well that they mostly store in clay pots**
- **67% of customers defined our water quality as "good" and 27% as "very good", with only 6% claiming that it is poor?**

These data confirm the **potential for bottled water as a promising solution;** but in the meantime, it shows that **old habits are strongly entrenched** and will require strong awareness efforts **to change.**

[20] National strategy for rural water supply, sanitation and hygiene, WASH in Schools and WASH in health facilities, March 2016
[21] Beneficiaries survey report, 1001fontaines, April 2020

Another interesting observation (which needs to be confirmed at a larger scale) is that **the penetration rate of our product is higher in the couple of villages equipped with piped systems** (people are very aware that the piped water is not drinkable).

Quality

In most rural households, children are sick very frequently because of diarrhea. **Water quality is the main health challenge in the country**, with no satisfactory solution combined with low awareness of the health risks of drinking contaminated water (no boiling …).

Specifically, it is hard to assess the quality of the bottled and piped segments but we can assume that the situation is similar (if not worse) than in Cambodia.

Continuity of service

Given the stage of the project, it is hard to assess water kiosks or piped networks against that criterion.

Long-term vision

Considering the maturity of both markets and the early stage of the project, **we do not yet have a vision concerning the complementarity of the models**. One of the positive signals is the strong involvement of all communities in the projects, whether or not they had piped systems available.

Our first target is to convince the **Government to consider community-based water kiosks as a strategic path** in the years to come. That said, we are always open to collaboration with organizations like UN-Habitat, which are active in the development of community water pipes (more than 300 already installed).

4. Appendix 4: Vietnam case study.

Country context

Vietnam is a large country in South-East Asia with 95 million inhabitants. Ranked 118th country in the world on its Human Development Index, Vietnam has had **remarkably steady growth** over the last two decades: while 70% of the population was living under $3 per day in 2002, that was reduced to 12% in 2015. However, **inequalities remain** and 25-30% of the population remains vulnerable to economic changes[22].

In a context of systemic pollution of water sources caused by human activity and the effects of climate change, poor **water quality (and not access) is the main health concern, causing 80% of diseases in Vietnam**[23].

In Vietnam, 1001fontaines (through a local social business "O-We Water Services Vietnam" in which impact investors Danone Communities and Colam Impact have also invested) has started a peri-urban pilot in 2018 in the Vinh Long Province of the Mekong Delta.

Clusters of drinking water access solutions

There are 3 clusters of water access solutions in Vietnam: traditional sources, tap water and bottled water (see below)[24]:

1001fontaines market study focus

	Category	Density (people/km²)	Tap availability	Use of 20L BW
	Urban	>5100	Almost 100%	>90%?
	Industrial	1100 – 5000	Almost 100%	85%
	Peri-urban	>1100	Very high	70%
	Non remote rural	500 - 1000	Medium	70%
	Remote rural	<400	Low	>50%?

Traditional sources are mostly groundwater and rainwater. The latter was widely used in the country, and is still considered an option in rural areas, due partly to the long historical perception that rainwater tastes better and might be more naturally healthful than piped or bottled water[25].

Tap water is spreading rapidly throughout the country but despite this wide access, it is **considered by the authorities as domestic water and hence non-drinkable**. **It is used for domestic purposes only** and **a small minority of people (less than 15%) actually drink piped water**, and they will systematically boil it.

In addition 40 to 80% of piped water schemes suffer early system breakdown[26], and officially more than 50% do not meet basic quality standards[27]. Regular scandals on the tap water quality unfolding in Vietnam are affecting people's trust in the tap water quality. A major contamination of tap water took place in October 2019 affecting 250,000 households in the Hanoi region and raised strong public concern.[28]

Therefore, most people will find alternative solutions and buy **20-liter water jugs, which are the main and favorite sources of drinking water**

[22] Riding the wave, World Bank, 2017

[23] Monroe Vietnam, 2010

[24] 1001fontaines benchmark, 2018

[25] Assessing household willingness to pay for bottled water in rural areas of the Mekong Delta, Vietnam, 2016

[26] SNV, Netherlands Development Organization, 2020

[27] WHO, 2011

[28] http://dtinews.vn/en/news/021/64630/hanoi-s-tap-water-contaminated-with-toxic-substance.html

Scale and impact

As seen above, both bottled water and pipe systems are mature solutions in Vietnam, and they are expanding extremely fast in the more remote areas. **The challenge in Vietnam is not access, but quality**.

Customer segments served

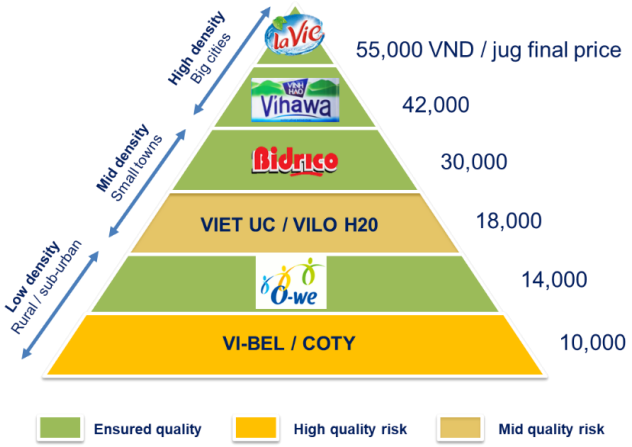
Given the maturity and scale of both solutions, pipe and bottled water have a strong geographic overlap. **All water kiosks studied until now are treating tap water as their raw water source.**

A market study was conducted in 2018 to assess the main drinking water sources among households in the Vinh Long Province[29]. The results are consistent with the national data:

- **80% of people use bottled water as their main drinking source** (70% 20-L, 5% 20-L boiled, 5% small bottle)
- 10% drink boiled tap water
- 10% drink boiled rainwater

Bottled water is a booming market, with a +97% growth from 2011 to 2016, and +63% projected for 2017-2021[29].

More specifically, the chart below illustrates the different segments of bottled-water customers:



- Upper middle-class urban families can afford to buy national or international premium brands at a price range of $1.5 -$3 per 20-L bottle
- Middle class families can afford to buy local premium brands, which are relatively safe for the most part, at a price range of $0.6 – $1.5 per 20-L bottle
- **Vulnerable households have no other choice but to buy cheap local brands with very high-quality risk**, at a price range of $0.4 - $ 0.6 per 20-L bottle

The ambition of the 1001fontaines project in Vietnam is precisely to enable these vulnerable households to buy safe water at a price they can afford.

Vietnam is a B-to-B-to-C market, in which people do not buy their bottles directly at the factory but rely on their local retailers who will very often deliver to the last meters. Some vulnerable households and migrant workers would also buy their 20-L bottles to their landlord who is renting them a small room and hence controlling commodities like tap water, electricity and bottled water.

The market of bottled water is highly fragmented with thousands of cheap brands (each small-scale manufacturer develops its own brand), and there is **no brand loyalty in the segment of vulnerable households**. People will buy the jugs that are available at the retailer, at the price they believe is competitive for them, although the brand has a very poor reputation. Consumers are **aware of the contamination issues** but **feel they do not have any other alternative**. This feeling is amplified by the frequent (and highly mediatized) scandals affecting small producers[30].

O-We Water launched its first water kiosk in April 2019 in Vinh Long and according to an in-house customer survey conducted in June 2019, **90% of customers declare to buy O-We Water for the recognized quality of the water**

[29] Statista, 2019

[30] http://www.irinnews.org/report/83965/vietnam-even-bottled-water-unsafe

that they evaluate through basic parameters like taste, smell and appearance. 70% of customers also declare to buy O-We for the convenience of the service provided[31].

Quality

The highly populated South Vietnam (10M in Ho Chi Minh City, 16M in the Mekong Delta) is facing **rising water-related issues** with three major threats: the impact of intensive agriculture (pesticides / insecticides), the impact of industrial activity (60% of industries wastewater is untreated, 90% for households[32]) and the impact of climate change leading to saltwater intrusions of most surface water resources even up to 150km in-land. The Mekong Delta is under global spotlight as climate-change migration adds up to chaotic urbanization.

The World Bank recently stated that "*Pollution is emerging as the greatest water related threat to the economy. The economic model developed for this study suggests that the main threat is the impact of water pollution on human health, which could reduce GDP by 3.5 percent annually by 2035* [33]".

O-We Water conducted a quality study of the market of bottled water in Vinh Long Province in March 2020. 46 samples of 19 different local brands of 20-L bottles were tested: **96% of them had some bacteria presence**, and some samples were showing very high contamination of coliform (>600 cfu/100ml) and aeruginosa (>9,000 cfu/100ml)[34]. This can be explained by 1) inadequate purification technologies and 2) violation of basic hygiene procedures and 3) poor management of the stock of jugs

The conclusion, here again, is **that quality of water is the main long-term health challenge in Vietnam**, and that the **bottled market regulation is far from being satisfactory at this stage**.

Continuity of service

O-We Water is active in areas of the Mekong Delta that are prone **to salinity intrusion** during the dry months. In the drought episodes, the salinity of surface and groundwater sources can get so high – up to 4 or 5 g/L - that **piped water operators have to temporarily stop their supply as their treatment process is often very basic and mostly relying on chlorination**. This is especially true for small-scale rural water treatment schemes.

Even small-scale bottled water manufacturers who mostly rely on Reverse Osmosis technology have to stop their activity because their water treatment system is not performant enough or properly maintained to be able to treat these levels of salinity. Thanks to O-We Water technical assistance and maintenance, **O-We Water kiosks have been able to operate throughout the dry season of 2020 with no major breakdown activity for the final consumers**.

Long-term vision

Vietnam is a very mature market in which bottled and piped water coexist, with clear distinctions between domestic and drinking usage. Infrastructures are already in a place. In a context where the quality of bottled water produced by small-scale players is very low with bacteriological contamination ranging between 50% to 95%, our role is to **focus on the bottled water market and contribute to the enhancement of its quality practices** (through our technologies, production standards, maintenance & quality procedures ...). Our vision is that **the bottled market will consolidate** itself in favor oe regional or national brands, and that **"survival of the safest"** will be the long-term dynamic.

[31] O-We Water market survey, June 2019
[32] ADB, 2010, Water Sanitation Assessment Roadmap
[33] WB, 2019, Vietnam Toward a Safe Clean and Resilient Water System
[34] O-we water quality study, March 2020


HONDA